

**Edi Santosa, Sudharto P. Hadi, Y. Warella**

Universitas Diponegoro, Semarang, Indonesia;

Email: Eedisantosa05@yahoo.co.id

# *Payment for Environmental Services and Polder Sustainable Management in the Context for Poverty Reduction in Semarang*

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## **ABSTRACT**

Environmental issues are externalities of economic development requires the handling of various instruments in order to be in harmony with the economic development environment. Payment for Environmental Services (PES) is now being developed globally as a market-based instrument that is promising to address the issue of degradation of natural resources and the environment. PES mechanism has to be said that the concept is simple and flexible in a variety of conditions, so that the application was highly variable throughout the world. The main problem lies in whether the Payment for Environmental Services (PES) that is now being developed globally as a market-based instruments are quite capable of dealing with poverty and degradation of natural resources and the environment. Refer to research finding shows that Tawang Polder has significant direct and indirect value for society. About 50% household stated that they accept PES and 20% who reject the PES. Even PES is quiet potential in reducing poverty in these areas. Even in the society level such as huge support in Polder systems, social capital and local wisdom, the system management of polder should be designed appropriately and have to increase the level of participation in decision making. Another factor is also important is polder institution which has to be design clearly and transparent based on performance standart. The last factor is politic capital should be aware of democratization.

Keywords : Environtmental Management, Poverty Reduction, Polder System

## **A. INTRODUCTION**

Environmental issues are externalities of economic development requires the handling of various instruments in order to be in harmony with the economic development environment. Although various environmental control instruments based Command and Control (CAC), or a market-based instruments such as levies 1(charges) has been widely applied in Indonesia, these instruments are not fully work effectively in dealing with increasingly complex environmental problems. Payment

for Environmental Services (PES) is now being developed globally as a market-based instrument that is promising to address the issue of degradation of natural resources and the environment. PES initiative has been developed in Indonesia either through cooperation between the private and the public by the government. Institutional complexity, space, socio-economic and fiscal aspects of diversity initiatives led PES appears logical. On the other hand, desire the development of PES in some areas either at the initiative of the public and local governments often face problems due to the lack of rules and guidelines. Although the legal framework described in the Law 32/2009 and Government Regulation on Economic Instruments are currently being finalized to be used as a reference for the development of PES, the rules do not fully cover the various aspects required in the development

Payment for Environmental Services (PES) is a market-based instruments for conservation purposes, based on the

principle that those who benefit from environmental services, should pay, and who produce the services should be compensated. In PES mechanisms, environmental service providers receive payment depends on their ability to provide environmental services desired or do an activity that nature can produce environmental services. In more detail, the definition of PES schemes according to Wunder (2005) is: *“Transactions of voluntary environmental services clearly defined, or land use that can guarantee these services, purchased by at least by the beneficiaries of environmental services, at least one provider of environmental services, if and only if the provider can guarantee a continuous supply of environmental services (It is a requirement or conditionality)”*. Basic economic theory of PES is conceptually simple fact that “beneficiary pays” or the beneficiaries pay (Pagiola, 2004). Although the above definition is often used to explain the meaning of the PES, but Mayrand and Paquin (2004) states that there is no commonly agreed definition of PES. Understanding of the PES has been more to the classification based on the environmental services, structures, and other types of payments. The absence of this definition in turn makes the implementation of the PES to be very diverse, and often cause confusion, coupled with the lack of clarity regarding the mechanisms that literature can be categorized as PES.

PES is basically a scheme that aims to provide environmental services that have been considered increasingly degraded, due to the lack of public appreciation of the value of environmental services, and also the lack of compensation mechanisms. PES scheme is a mechanism that makes the provision of environmental services to be more cost efficient in the long term. Rosa et al (2002)

describes the conventional approach of PES as:

1. An optimization-based economic instruments, looking for the lowest possible cost to achieve environmental management objectives.
2. Focus on a single ecosystem management such as carbon sequestration or carbon sequestration, watershed hydrology management or biodiversity conservation.
3. A large-scale ecosystems simplify preference, to have some people to reduce transaction and monitoring costs.
4. Aims to protect private property rights and reward (reward) for the land owner.

PES of the basic structure of the mechanism has to be said that the concept is simple and flexible in a variety of conditions, so that the application was highly variable throughout the world. As described by Pagiola (2003), PES schemes can be performed on various types of environmental services such as carbon sequestration (*carbon sequestration*), Watershed hydrology management, biodiversity conservation (*biodiversity conservation*) or landscape sustainability for ecotourism (*landscape beauty*), which previously must be defined, measured and quantified to be generated in this scheme. Understanding knowledge of this course is required to make the scheme attracted the participation of the beneficiaries of environmental services. Thus the identification of the required services and beneficiaries at all levels is needed. Environmental services can be produced and utilized by providers and users of various levels of local, national and international, and of the government, enterprises, local communities, individuals, or a mixture of all of them, depending on the nature of environmental services itself.

PES schemes are essentially basic structure suggests that beneficiaries provide environmental services payments to land users whose activities have an impact on the availability of services in a sustainable environment for the benefit of beneficiaries. How the funding mechanism and also the payment system was designed through a specific governance agreed by both parties.

Bishop and Mills (2002) in Pagiola (2002) states that the development of PES begins the most crucial thing is to define, measure and quantify the environmental services themselves (carbon sequestration, etc.) that will be generated in this scheme, this course requires significant scientific understanding. Beneficiaries may come from the local community itself, national level (government, NGO or private company) or also at the international level (international NGOs, other governments), or it could be a mixture of all three. PES scale development requires a mechanism to manage the funding and financing of the payments to the beneficiaries of an environmental service provider or in this case land users.

Flexibility PES schemes can also be seen from the scheme could be based on the amount of the payment that the area which is the subject of land use change, or on a specific land use practices. Can be directed at the area, practice, or specific attributes with common criteria. PES schemes can also be also in the form of non-monetary benefits such as training on users of land, infrastructure or help to diversify revenue or market development (Mayrand and Paquin, 2004).

This paper aims to provide an overview of how the implementation of the PES in the Polder Tawang in the Semarang City, as well as examine the economic valuation of Tawang Polder. To

answer this question it will be presented the theoretical foundation related to payments for ecosystem services and economic valuation polder Tawang. This study uses mixed-method research approach is expected to provide a thorough overview of the implementation of the management of the polder Tawang. Expected results of this study will contribute to the development of management strategies of Tawang Polder in Semarang City.

## **B. STATEMENT OF PROBLEM**

Environmental control instruments based Command and Control (CAC), or a market-based instruments such as levies (charges) has been widely applied in Indonesia, these instruments are not fully work effectively in dealing with increasingly complex environmental problems. The main problem lies in whether the Payment for Environmental Services (PES) that is now being developed globally as a market-based instruments are quite capable of dealing with poverty and degradation of natural resources and the environment.

## **C. METHODOLOGY**

In line with Yin (1995), this research chooses a mix-method research with some of data collecting technique to Accomplish the research objectives. The plus point of choosing a mix-method is on the reserach question “why” and “how” that to a contemporary set of events, where the researcher does not have the opportunity to control the events. Data is collected by revealing Become phenomena that focuses rvesearch. It is Because The research is using focus groups and in-depth interview technique dissusion.

The unit analysis of these research consists of institution and individual, where institution is the

Government of Semarang City while in the level of society is selected three sub-district such as Tanjungmas, Purwodinatan and Bandaharjo. Total number of sample is 137 consists of 104 households and 34 stakeholder. 104 respondent consists of family who seek the job and poor family and categorized as supply labor is environment services, while 34 stakeholder consist of government institution, corporate or business organization and individual who interest in environment issue.

#### **D. SUSTAINABLE MANAGEMENT OF POLDER TAWANG**

Polder Tawang Semarang is a system to protect the area from out of spills dam water level control inside the Old City. The polder system components consist of: dikes, sluice gates, canal, collector, pump water and retention ponds. With  $\pm 1$  ha land area. Polder is situated in front of the Tawang Station has  $\pm 70$  ha catchment. The northern part of the railway is limited, restricted Ronggowarsito Road at east, south and west by road Petudungan by Kali Semarang. Polder Tawang is one of the beautiful places for Pre Wedding.

Polder Semarang Tawang is a part of the ecosystem, the environment in the course of mutual reaction between the living and natural factors. Therefore, utilization of Polder Tawang in effect making the changes in the ecosystem, so planning in order to use multipurpose polder development process can not be viewed in isolation, but always done in conjunction with the ecosystems that support them.

Polder Tawang Semarang in addition to producing goods and services that can be consumed, also produce environmental services that provide other benefits, such as the benefits of beauty, recreation.

Given the importance of the benefits of these natural resources, the benefits need to be assessed. For example, the value of flood control, tourism and recreation in the surrounding communities. Therefore polder management and environmental goods and services, need to be given the value / price (*price tag*).

Polder management basically aims for sustainable development (*sustainability development*) is about economic growth, social welfare and the distribution of environmental quality improvement by involving all relevant parties (*stakeholders*). The form of management that is developed to preserve the upstream areas in order to remain sustainable natural resources. Availability of natural resources is very influential to the lives of people around the watershed, such as for agriculture, fisheries, industry and domestic water for household consumption.

Kali Semarang Sub-watershed within the polder area of the old city is one of the sub-watershed is very important and strategic for the people around the upstream and downstream polder polder Tawang, because the polder system has the ability to control the flood and *stock* water supply throughout the year which empties down to the sea. Institutionally, the management system is carried out by the government in particular, PSDA and Tourism Department is still not well coordinated. Besides that, it also faced technical problems, maintenance and operational funding limitations adverse environmental conditions. As a result, it is technically not optimal for flood control and rob, ecologically not able to conserve and weak in tourism functions. Poor retention pond conditions characterized by poor water quality (smell), sedimentation, pollution and environmental

setting that is not beautiful and comfortable. On the other hand, the participation of local communities and other stakeholders in the management of polder systems is still very low, as there is no maintenance program is carried out by volunteers or social institutions.

From the perspective of environmental economics, in particular economic valuations following polder system supporting infrastructure, it can be said that Tawang polder system development investments are very large, amounting to Rp Rp. 5.8 billion, - with details of the source of funds from BLN Rp. 4.711106 billion, - and the Fund II Special Presidential Assistant for Rp.1.177.777.000 can be said to fail from use value criteria / benefits. Therefore, if the Tawang polder system to function properly, it must be a multi-function polder (raw water supplies for fire fighting, watering the garden city). Therefore, the economic valuation of natural resources in the sub-watershed time Polder Tawang Semarang and system is very important to do.

The identification process is carried out to find out the actual conditions that occur in Sub-watershed Kali Semarang and Polder system. In identification of natural resources, the method of analysis used is descriptive analysis. Descriptive analysis aims to provide an overview or description of the condition of the population in Sub-watershed Kali Semarang, especially within the System Polder Tawang district. Furthermore, in this research, economic valuation of natural resources. Economic valuation of natural resources was conducted to determine how much the value of natural resources for the flood control, tourism, conservation, fisheries, and industry, and also the value of existence, heritage value, option value, and the

value of ecotourism, as well as the value of water and carbon values.

#### D.1. PROTECTION AND MANAGEMENT OF INSTRUMENT MARKET-BASED ENVIRONMENTAL

Natural resources and the environment provides services that varies for human survival, ranging from clean water, clean air, natural beauty, fertile soil, forests as carbon sinks, and so forth. individual, industry, and the community is dependent on ecosystem services, both from the starting raw materials, production process to function. The need for environmental services is not necessarily to make us appreciate the value of natural resources and the environment, as appropriate, and often we assess the environmental services under its value, or no value at all. It gives the environmental conditions being rapidly degraded. Data from the *Millennium Ecosystem Assessment* (2005) states that 60% of the studied ecosystem services are degraded more rapidly than the ability to fix it.

One major cause of environmental degradation is due to the nature of natural resources and the environment tend to be public goods, which led to the failure of the market. In this situation the conventional policy instruments often experience difficulties in protecting and maintaining environmental functions. Nevertheless, the market functions as a regulator of the allocation and distribution of goods and services can still be used as an instrument to produce an efficient allocation through institutional support. This mechanism is known in the realm of environmental economics as a mechanism - the creation of a market or *market creation*. Simply put the market that do not work (*missing market*) because of the environmental



components that are not traded, generated through buy-sell mechanism by first providing economic value on environmental services and further supported by the institutional functioning of the market. One such mechanism is carried out for the environmental services market that had been considered as free goods which then tends to happen over-exploitation and over-consumption. Scheme governing the environmental services market as it is known as Payment for Environmental Services (PES).

#### **D.2. INSTRUMENT FOR PRO ENVIRONMENT, PRO GROWTH, PRO POOR, AND PRO JOB**

PES scheme initially was designed for environmental management purposes, and are not designed to alleviate poverty. However, the journey turns PES instruments provide opportunities for poor people living in rural and forest areas to be involved in this scheme and earn extra income either directly in the form of cash on their activities to rehabilitate and conserve forest areas, such as increasing their capacity building through training, or in the form of incentive payments for rights to management of most forest areas that they can try to plantations, and etc. Form of payment for environmental services provided to service providers should discuss with the community, so as to suit their needs. Studies on payments for ecosystem services from the perspective of the people in Asia stated that more people appreciate the kind of reward in the form of in-kind or non-monetary (Leimona et al., 2009).

During its development, especially PES schemes in developing countries is then used for purposes other than conservation, also aimed to benefit the rural poor. This scheme is used to transfer financial

resources from those who need the services of a consistent environment and continuously to the people who are socially and financially fragile. However, due to the lack of data and monitoring systems are good, until now there is no clear evidence on the impact of the PES to the poor socio-economic communities. However poverty is not the main goal of this program. However, although by definition the beginning PES, poverty alleviation is not the main goal of the program, but in design, process and final output, should be should be pro-poor, because according Leimona et al. (2009), if this is not done, then both conservation and poverty reduction goals will not be achieved.

PES development in developing countries, is expected to provide potential benefits in the short term and also in the long term. Short-term benefits such as to increase direct income for consumption or investment purposes, improve the nutrition of infants, increased access to education, public health, economic production, and others. Another benefit is immediately felt by the community capacity building community capacity building, in terms of experience and networks in business and economic transactions, as well as interaction with intermediaries / facilitators are usually derived from international NGOs. PES also has a significant social impact on increasing understanding and awareness of the community in terms of environmental management, so as to give effect to the increased durability and quality and quantity of natural resources and environmental services. Another thing which is obtained from the PES is the social impact of social capital, where social cohesion in communities grow in implementing PES group, as happens in some PES initiatives in

Indonesia (Lombok, Lampung, etc.). Study the impact of livelihood in Cidanau also showed the same trend, namely the social impact of the most noticeable increase (Leimona et al, 2010).

PES schemes also indirectly provide employment opportunities to rural communities through a variety of activities in the PES scheme itself. People are given the opportunity to obtain alternative employment, of those activities might initially penetrated the forest to sustain their lives. Likelihood of illegal logging and degradation of forest areas due to lack of alternative employment for them after a specified forest area as a protected area for example, in addition to impact on the sustainability of the forest as a source of their lives, but also the sustainability of the economic life of their own.

At the macro level, the PES provides a wider impact on increasing economic growth both locally and nationally, as well an increase in environmental quality resulting from the development of PES will be followed by an increase in aggregate economic life of society. Thus, this is basically a PES scheme is in line with the direction of Indonesia's development that is based on a triple-track development: Pro-growth, Pro and Pro poor job, and coupled with the government's policy direction in 2011 the Pro fiscal policy environment.

### D.3. ECONOMIC INSTRUMENTS FOR ENVIRONMENTAL SERVICES UTILIZATION POLICY

Besides economic development aimed at improving human welfare, actually also able to maintain the sustainability of natural resources and the environment is one of the development capital. Although natural resources and the environment is a quarter of the total assets of prosper-

ity Indonesia, these natural assets more quickly and more degraded impact on the economic loss development itself. Various attempts have been made to restore the vital role of natural resources and the environment in the context of economic development, but these efforts have not been enough to put the multi-functional nature of natural resources as a function of the economic, social, ecological and cultural.

Policies to improve the quality of the environment has been widely applied in various countries around the world, including in Indonesia. Based *command and control policies*, such as policies pollution standards, policies Environmental Impact Assessment (EIA) for activities that could potentially have a negative impact on the environment, waste management policy. The scheme of environmental protection and management of which we known in Indonesia. It is recognized that the protection schemes and environmental management are yet to be fully relied upon to sustain the quality and quantity of the environment, as evidenced by the still growing *trend* of environmental degradation and pollution in Indonesia. Needed various other schemes which can be used as complement to existing policies, to push the speed improvement of environmental quality in Indonesia.

Government Law No. 32 of 2009, introduced a new model of environmental protection and management and economic instruments. Environmental economic instruments are instruments of protection and market-based environmental management. Economic instruments is relatively new in Indonesia, although some instruments are categorized as economic instruments such as Payments for Environmental Services (PES) has

been widely applied to various initiatives in both the sectoral and local scope. PES is one of the instruments are well known, and is expected to be one of the incentive-based instrument that can be relied disincentives for sustainable environmental protection. In accordance with the mandate of Law No. 32 of 2009, to encourage the implementation of economic instruments PES, the government is required to direct and promote the implementation of these instruments through the preparation of the PES protocol.

#### **E. PAYMENT FOR SERVICES OF ENVIRONMENTAL POLDER TAWANG IN SEMARANG CITY**

Economic valuation is needed in deciding the development policy choices related to natural resources and the environment. Therefore, quantification of benefits (*benefits*) and disadvantages (*costs*) must be done so that the decision-making process can be run with the aspect of justice (*fairness*). Economic valuation goal basically is to help decision-makers to estimate the efficiency of the economy (*economic efficiency*) of various possible utilization.

Total Economic Value (TEV) could mathematically calculated by:

$$TEV = UV + NUV$$

$$UV = DUV + IUV + OV$$

$$NUV = EV + BV$$

$$TEV = UV + NUV = (DUV + IUV + OV) + (EV + BV)$$

Where:

TEV = Total Economic Value

UV = Use Values

NUV = Non Use Value

DUV = Direct Use Value

IUV = Indirect Use Value

OV = Option Value

EV = Existence Value

BV = Bequest Value

Use value (*use value*) is obtained from the actual utilization of natural resources and the environment. Value associated with the use of value as a person using or expect to utilize in the future. In the context of this polder Tawang use of the value obtained by counting the number of families who benefit from the existence of the polder. The direct beneficiaries include the population of the Village Bandarharjo, Tawang Mas and Purwodintan. Based on statistical data from the BPS in 2012 the total population of the three villages is 58.381 inhabitants with the number of families of 16.396 households. Based on the results of the focus group was conducted on the three villages are apparently about 59% of them turned out to benefit directly from the development of this polder is secured from the flood area or in the language of extreme flooding where flooding is due to the floods caused by flood and flooding caused by sea. Segmentation families directly benefit the poor, especially families who are working in the informal sector. Polder development aimed at flood control is expected to ensure the community surrounding polders to run their economic activities. When viewed from the family economic data, the average family income is Rp. 1.200.000, -. From this information it can be calculated using the value (*use value*) is the formula (% receiving x number of households x average earnings) or (59% x 16,395) x Rp. 1.200.000, - to Rp. 11,607,660,000, -.



*Direct use value (direct use values)* is calculated based on natural resources and environmental contribution in helping the process of production and consumption current (Munasinghe, 1993). The direct use value *includes all the benefits of natural resources and the environment can be estimated directly from production through consumption and unit price based on market mechanisms*. Direct use value is directly related to the output can be consumed. Direct use value (DUV) is part of the use value (UV). UV calculation is calculated from the proportion of households who benefit from the multipurpose polder multiplied by the proportion of households who work directly related to the presence of this polder. The type of work that can be raised as a result of this polder pembngunan include stalls, taxis, grocery stores, as well as the service sector. Based on BPS data show that the proportion of families who work in this sector is 60%. From this data it can be calculated that the value of NUV:  $60\% \times (59\% \times 16,395) \times \text{Rp. } 1.200.000 = \text{Rp. } 6.964596 \text{ billion, -}$

*Indirect use value (indirect use values)* is determined by the benefit derived from environmental services to support the flow of production and consumption (Munasinghe, 1993). Indirect use values obtained from environmental service function in providing support to the process of production and consumption today. Thus, *indirect use values constitute the functional benefits of the ecological processes of ecological processes that continually contribute to communities and ecosystems*. For example polder capable of functioning properly provide clean air, recreation area with a beautiful view, flood control and erosion and provide water sources. Indirect Use is calculated from the proportion of people who benefit indirectly as tourism

and recreational activities. Identification results of the direct beneficiaries of approximately 25% to the value of indirect usage is  $30\% \times (59\% \times 16,395) \times \text{Rp. } 1.200.000 = \text{Rp. } 3.347298 \text{ billion, -}$

*Value option (option value)* associated with the use of options in the future environment. Uncertainty of future use is closely related to the uncertainty of the environment. Option value is the consumer's willingness to pay for assets that do not want to use the excuse to avoid the risk of not being able to use it again in the future. Thus the choice of value for the benefit of the environment and natural resources are not exploited at this time, but kept for the sake of the future. Based on the results of the FGD option value is about 10% or 10% can be computed  $\times (59\% \times 16,395) \times \text{Rp. } 1.200.000 = \text{Rp. } 1.115766 \text{ billion, -}$

*Intrinsic value or the value of non-use (non-use values)* given the value of natural resources and the environment on the basis of its existence, although it is not consumed directly. The values given are in fact difficult to measure and analyze, since they are based on the preferences of the environment (related to the motive or generous nature) rather than direct use (Munasinghe, 1993). Intrinsic value associated with a positive willingness to pay value if one does not intend to use it (Pearce and Moran, 1994), then the value is divided over the value of existence (*existence values*) and heritage values (*Bequest values*). This value can be computed from people's willingness to pay compensation, where the identification of the average ability to pay is Rp. 1.000, -. If this fee can run with the assumption that 60% of people in all three villages are willing to pay the NUV is  $60\% \times \text{KK} \times \text{Rp. } 1.000, -$  is equal to  $0.6 \times 16\,395 \times \text{Rp. } 1.000, - = \text{Rp. } 9.837 \text{ million, - / per year.}$

*Value of existence (existence values)* have value because of the satisfaction a person or community on the existence of an asset, although concerned no desire to use it. Value given the existence of a person or the public to natural resources and the environment merely as a concern for providing aesthetic benefits, spiritual and cultural. This value is calculated with the assumption of 70% or  $0.7 \times \text{Rp. 9.837 million}$ , =  $\text{Rp.6.885.900}$  , - / year

*Heritage value (Bequest values)* associated with the willingness to pay is given by today's society to protect the environment for the benefit of future generations. Values arise because of the existence of satisfaction with the existence of resources, although the individual is not willing to use it. This value is calculated with the assumption of 30% or  $0.3 \times \text{Rp. 9.837 million}$ , =  $\text{Rp.2.951.100}$  , - / year

## F. ECONOMIC VALUE OF TAWANG POLDER MANAGEMENT

Another function of this Tawang retention pool for the community is an inexpensive recreation and sports facilities. But in fact there are some obstacles and problems that arise so that these functions become less optimal for retention of the benefit pool as a means of recreation and sport, and is due to, among others:

1. Or less can not function fully in addressing rob and flood the surrounding environment so that when it rains the water discharge will rise, and this will be flooding;
1. If the dry conditions in the dry season, the emergence of a negative impact pungent odor that would be polluting the air around the pool, although there has been a means of aeration but it does not work;
1. Due to the impact of the onset of the odor it

can not be functioning optimally surrounding the pool and as a cheap means of recreation for the community, such as fishing spots, sports, water tourism and so on, which can be optimally beneficial if this will contribute positively to the Government of Semarang in particular and society in general.

Of observations in the field, while reducing the impact to a smelly done manually and simple way is to take the waste thick / dense that no water collects on the surface side / northwest side of Retention Pool. Waste thick / dense green is one of the source of the smell is very smell, especially during the dry season. Handling is done manually and is certainly very simple not optimal to reduce or even eliminate the impact of the smell, then it should be pursued with the right system with the *Water Treatment* . In order to calculate the economic value is calculated with the formula number of local government budgets in the flood control program in 2012 in the amount of 22 billion used in the flood control, conservation of the old city area and tourism.

### F.1. CONTRIBUTION ON POVERTY REDUCTION

Environmental Management Plan in Semarang city include System Environmental Sanitation and Drainage Network System. Plan Environmental sanitation systems general domestic waste management for the city of Semarang should refer to the Plan for the National Strategy for the Management of Household Waste Water Urban Areas. Domestic waste is waste from household waste in the form of stools and other liquid waste such as used water from laundry and others. Waste han-

dling is not easy because it involves people and government are intertwined in the handling and requires considerable cost. Domestic wastewater treatment are generally divided into two (2) types of System On-Site and Off-Site System. On-Site System, which discharges directly channeled to the septic tank and the liquid is absorbed by the soil. Off-Site System, which uses the waste water drain system to drain waste water from households and processed somewhere specific.

Based on the topography of Semarang, Semarang drainage system can no longer rely on pure gravity system, but the system is a combination of gravity drainage systems, sea polders and dikes. In addition, the burden of drainage from the upstream region needs to be controlled with rainwater harvesting facilities. The drainage system was developed based on the concept of one watershed management plan. Each drainage system divided into upstream and downstream areas.

Analysis of function Polder Tawang rehabilitation needs to be done and the aspects of the analysis to be described is the existing condition Polder Tawang as a system to decrease the function / benefit of early development plans. Another important aspect in the evaluation program is an analysis of the polder system, including existing conditions in the inlet and outlet doors polders; screen ; pond and pump house and water disposal system conditions.

Overall Polder Tawang system on the plan initially used as a temporary holding pond ( *retaining basin* ) for water and tidal flooding in the area around the polder. The water is pumped out of the polder reservoir and flowed to the river. Thus inundation occurred at locations around can be minimized both the duration and volume. Along

with declining function as an Tawang polder temporary shelter for the flood water surrounding area, it also raises new problems, namely the emergence of the odor of stagnant water pools. But the new problem is not discussed because the separate activities have been compiled DED Water Treatment as a solution. Problems decreased function / benefit Polder Tawang as a holding pond for rob and flood control efforts in the surrounding area at this time requires attention to immediate business function optimization Polder Tawang. Initial question is the preparation of the redesign Polder Tawang system as well as the surrounding drainage system evaluation.

In calculating total labor force using the formula:

$$NFTK = \sum_{i=1}^n (T_i \times W_i \times IP_i)$$

$T_i$  = Total Labor force  
 $W_i$  = Daily Payment  
 $IP_i$  = Indexs (%/year)

The number of poor family where living around Tawang Polder, could be seen in table below :  
(see table 1)

TABLE I. PROPORTION OF POOR FAMILY IN 2013

Village	Number of Households	Number of Poor	Total Population	Number of Poor
Bandarharjo	6.100	1.635	21.117	5.659
Tanjung Mas	8.802	2.359	32.093	8.601
Purwodinatan	1.494	400	5.171	1.386
Total	16.396	4.394	58.381	15.646

(\*) estimated from BPS 26,8% living in poor

By using the formula and the number of household each village, could be estimated the total number of family could be as labor force in around Tawang Polder, like in the table 2.

## F.2. WILLINGNESS TO PAY ( WTP) OF TAWANG POLDER

Basically Willingness To Pay ( WTP) of beneficiaries and also wishes to receive from the provider will depend on various things, and this of course relates to the balance of *supply* and *demand* . Beneficiaries will usually find the cheapest cost provider of services, although there is now interest developments concerning the additional benefits of PES agreements, such as habitat conservation, poverty alleviation and other factors. Also growing number of users who wish to obtain a deal that has

proven benefits to the surrounding community, or are supported by credible NGOs, so as to reduce the risk that the transaction will be *greenwash* or futile.

Economic valuation of environmental services can also be done through either the revealed preferences (revealed preference) or stated preference (stated preference). This assessment basically determines the value of environmental services based on willingness to pay (WTP) of individuals or communities were abstracted from the preferences of the community through the auction (bid) is

TOTAL NUMBER OF LABOR FORCE IN TAWANG POLDER

ACTIVITY	LOCATION	INTERVAL *) (MONTH)	FREQUENCY (YEARLY)	NUMBER OF LABOR	LABOR/DAY
Cleaning around polder	Saluran drainase perkotaan	Daily	365	5	1825
Cleaning grass/dam	Tanggul perlindungan banjir	12	1	10	50
	saluran drainase perkotaan	6/12	1/2		
Waterfront	saluran drainase perkotaan	6/12	1/2	5	25
Dam renovation	Tanggul perlindungan banjir	12	1	5	25
	saluran drainase perkotaan	12	1		
Water management	Semua bangunan pengatur air	6	2	2	24
		6	2	2	
		6	2		
		12	1		
Buliding	Berbagai	12	1	5	62
Other Fasility	kantor	12	1	2	24
	rumah rumah peralatan				
Cleaning River	Pengerukan dan tanggul perlindungan banjir	12	1	10	120
Total of Labor	/				2155
Standar Pay Rp. 40.000,					40.000
Total value/ year					86.200.000,-

## WILLINGNESS TO PAY POLDER TAWANG SEMARANG BASED ON FGD

NO	STAKEHOLDER	BANDARHAJO	TANJUNG MAS	PURWODINATAN
1	Ordinary Family	Rp. 1.000,-	Rp. 1.000,-	Rp. 1.000,-
2	Local Leader		Rp. 2.000,-	-
3	Seller	Rp. 1.500,-	Rp. 1.500,-	Rp. 1.500,-
4	Corporate :			
	PT. KAI		Rp. 10.000,- to Rp 30.000,-	
	Pelindo			
	Sariboga			
	PT. Jasa Transportasi			

offered. Some methods are quite popular for this approach include the Contingent Valuation Method (CVM), Travel Cost Method (TCM) and Hedonic Price. Limitation of this method is that based on the stated preferences, may not be their true preferences, so that the estimated WTP and WTA can not always be translated into actual payment of environmental services. Information that is non-symmetric can also occur between providers and users of environmental services, so if there is one taking advantage of the ignorance of others in negotiating payment system. Problems decreased function / benefit Polder Tawang as a holding pond for rob and flood control efforts in the surrounding area at this time requires attention to immediate business function optimization Polder Tawang.

### F.3. ENVIRONMENTAL SERVICES POLDER TAWANG

Calculation of the value of these ecosystem services will involve a variety of basic methods for economic valuation that can be perceived directly ( *tangible* ) or not ( *intangible* ), market ( *market* ) and non-market ( *non-market* ). Calculation of the value of ecosystem services also involve the calculation of the cost of benefits, which will be used in the calculation of the value of payments for environ-

mental services. Utilization experts economic valuation is important in calculating the value of environmental services, as economic valuation methods used are still very specific, rigid, and difficult to measure. Calculation of the economic value of ecosystem services is usually determined from the desire to pay (WTP / *Willingness to Pay* ) of beneficiaries and Desire Accept (WTA / *Willingness to Accept* ) from the Provider.

Basically willingness to pay of beneficiaries and also wishes to receive from the provider will depend on various things, and this of course relates to the balance of *supply* and *demand* . Beneficiaries will usually find the cheapest cost provider of services, although there is now interest developments concerning the additional benefits of PES agreements, such as habitat conservation, poverty alleviation and other factors. Also growing number of users who wish to obtain a deal that has proven benefits to the surrounding community, or are supported by credible NGOs, so as to reduce the risk that the transaction will be *greenwash* or futile.

Economic valuation of environmental services can also be done through either the revealed preferences (revealed preference) or stated preference (stated preference). This assessment basically determines the value of environmental services based on willingness to pay (WTP) of individuals or



communities were abstracted from the preferences of the community through the auction (bid) is offered. Some methods are quite popular for this approach include the Contingent Valuation Method (CVM), Travel Cost Method (TCM) and Hedonic Price. Limitation of this method is that based on the stated preferences, may not be their true preferences, so that the estimated WTP and WTA can not always be translated into actual payment of environmental services. Information that is non-symmetric can also occur between providers and users of environmental services, so if there is one taking advantage of the ignorance of others in negotiating payment system.

## **G. DISCUSSION**

Payment schemes and payments for ecosystem services in Indonesia needs to be developed in the context of sustainable development and poverty alleviation. In practice, the need to consider the initial prerequisite of the scheme which starts from ngkatan pence strategies for strengthening livelihoods, including social capital, and legal certainty of access of communities to manage land and other natural resources. Lessons from the implementation of compensation schemes for environmental services in countries of America, among others, that the compensation for environmental services is not the only 'effective pill' to reduce poverty in the region and control ling degradation ward. To function as a valuable instrument to strengthen and diversify livelihoods enhancement strategies, compensation schemes should be part of a broader development strategy.

Adaptation of compensation schemes for environmental services needs to be done carefully to match the conditions in Indonesia. Policy input

to the national level is desirable because the current payment and payment for environmental services in Indonesia I still localized to specific cases with different levels of implementation. As an input in national level policy on the purpose, the need for policy advocacy is lifted from the experiences of the local level. Although the government's role is very important in this process, government intervention still needs to be examined critically so as not to turn off local initiatives. Workshop participants have identified that there is a regulation that has a legal basis this scheme.

Consider a few things that need to be done before making regulations regarding environmental services scheme, among other things: an understanding of the regulation of payments for ecosystem services, government, legislature, and the public should be adequate; observe laws and regulations related to the existing regulatory environment reward for kinan possibility of overlapping regulations should be avoided, and a more flexible regulation at the national level and specifically at the local level.

Negotiations and increasing social capital is an important entry point in the implementation of payments for ecosystem services. Reference of the technical side of the PES scheme is necessary to form an opinion and input to negotiate. In line with this, in-depth study should be conducted in accordance with the needs and potential in a region. Direkomenda Sikan also about the need for a structured institution that can serve as collateral so that environmental services in Indonesia can bekecimpung at the global level, among other innovative financial institutions that can address national challenges for sustainable natural resource management and poverty alleviation in Indonesia.

There are three types of recommended capacity building, namely the concept of payment for environmental services, legal drafting of PES schemes, and sharpening skills or expertise, such as marketing, silviculture, negotiation and coordination between government departments.

Besides this discussion group also recommends the implementation of payments for ecosystem services evaluation sector in the location and development of assessments that have been carried out by various agencies. At the end of the workshop, lang-kah recommended key steps in the development of PES schemes in Indonesia are: the creation of national regulations, in addition to the potential inventory of existing initiatives, packaging concepts through various publications and events 'marketing' ideas to be easily understood, preparation capacity of relevant stakeholders: communities for environmental services providers, utilizing *jasalingkungan*, regulators (government agencies), non-governmental organizations (NGOs) whose role *sebagai perantara*, and the preparation and monitoring devices *evaluasi pelaksanaan* environmental services scheme. Form a work team also managed to set up the network as a function of the initiative *motor penggerak pengembangan* payment and payments for ecosystem services and follow up on all recommendations made in the workshop.

In its function as a facilitator, it is the motor network, the central coordination and communication of the various initiatives development reward / payment for environmental services in Indonesia. Environment service is the product of natural resources and ecosystems in the form of direct benefits (tangible) and / or indirect benefits (intangible), including the following: nature tourism

services, protection services hydrology (hydrology), soil fertility, erosion and flood control, natural beauty and uniqueness, sequestration and storage of carbon (carbon offsets). Environmental services generated from various types of land use (forest or agriculture), also both freshwater waters (rivers, lakes, swamps) and the sea.

Environmental services generated from a combination of natural assets, human quality, conducive social conditions, as well as technical modifications. Four types of environmental services that have been recognized by the global community today is:

- 1) environmental services water system,
- 2) environmental services of biodiversity,
- 3) carbon sequestration environmental services, and
- 4) the beauty of the landscape of environmental services.

The world's poor whose lives are very much dependent on nature. Destruction of nature will make them become more suffering and their livelihood options will continue to diminish. Amid the earth's carrying capacity and poverty is increasing, emerged a global commitment to minimize the negative impacts that may arise as well as trying to maintain a variety of options to improve people's lives in ways that are sustainable. In tackling environmental degradation, one of which can be done through the use of environmental services. Recognition of environmental services, namely ambiguous environmental protection and poverty eradication. Changes in the structure of incentives would be able to realize behavior change to make it more conducive to the provision of environmental services made possible by the

existence of regulatory enforcement, the payments are balanced, and moral pressures that go hand in hand. This through the use of environmental services payments (benefits) or environmental services Payments for Environmental Services (PES). Why is payment for environmental services (PES) is very interesting? According to UN-ESCAP (2009), PES interesting because:

*Reduced provision of environmental services.* Increase the income and population growth led to changes in land use and reduced environmental services has reached alarming stage. With increasing understanding of the socio-economic value of ecosystem services and cultural continued increase in population and economy, the value of which is increasingly scarce ecosystem services will only increase.

*Impacts of climate change.* Environmental services become more valuable due to the effects of climate change. Extreme weather events, floods, landslides, storms and droughts due to climate change impacts reduce gross domestic product (GDP) countries of the world, such as Southeast Asian countries is estimated to lose 2.2% - 6.7% per year by the end of this century. Effective environmental management is known as a way to overcome some of the costs (which are used to repair damaged environments) are increasing rapidly.

*Potential to leverage the value of services and generate sustainable financing.* PES teaches service beneficiaries (users) of the value of environmental services through monetary payment. PES has the potential for sustainable financing to complete the funding of the public. PES can also be used to leverage funding provided by the government to achieve greater results. PES allows flexibility in the design of decision-makers combining public and

private sector participation such that enlarge the provision of services at any particular matter.

*Growing international market for carbon storage services.* PES gained attention as they relate to mitigation efforts (mitigation impacts) of climate change. Deforestation is responsible for about a fifth of greenhouse gas emissions (GHG) world. Carbon storage market that is growing has facilitated PES for Reducing Emissions from Deforestation and Forest Degradation (REDD).

The purpose of financial and non-financial payment for environmental services are: as an alternative production systems and land management are more environmentally friendly, as an effort to improve the welfare of land managers, as efforts to protect the environment and management of natural resources for economic and social development that is sustainable. Environmental services are (a) individual, (b) community groups; (c) association, (d) a business entity, (e) local government, (f) the central government, which manages the land that produces environmental services and has a license or pedestal the land rights of the competent authority. While the beneficiaries of environmental services are (a) individual, (b) community groups; (c) association, (d) a business entity, (e) local government, (f) the central government, which has all forms of business that harness the potential of environmental services with not harm the environment and do not reduce the principal function. Beneficiaries of environmental services outside of Indonesian law jurisdictions subject to the legislation in force.

## G. CONCLUSION

Polder management basically aims for sustainable development (*sustainability development*) is

about economic growth, social welfare and the distribution of environmental quality improvement by involving all relevant parties (*stakeholders*). Polder Semarang Tawang is a part of the ecosystem, the environment in the course of mutual reaction between the living and natural factors. Therefore, utilization of Polder Tawang has an effect in making the changes in the ecosystem. In order to use Tawang polder development can not be viewed in isolation, but always done in conjunction with the ecosystems that support them. Detail conclusion could be identified :

1. Actual condition of natural resources in Semarang river at this time is disfunctional and the conditions has been damaged. The malfunction of Polder Tawang system have an impact on the damage of the ecosystem include water quality retention, pond poor, slum conditions, silting in the upstream and downstream.
2. Analysis of policy implementation can be summarized that the management system is still adhered to the principle of policy, the model of power policy approach that does not involve the role of the public (interest based approach) fault government policies, lack of community awareness about population growth and the role of stakeholders.
3. Social capital has the potential to participate the following Polder systems management such as values of trust, networking models and Political Capital has a policy to control the power management system of polders sustainable development.
4. Change implementation of policy orientation Polder Model sustainable management system based on social capital and political capital in the application of sustainable Polder System Environment by involving the poor.
5. From the perspective of environmental economics, in particular economic valuation polder system and its supporting infrastructure, it can be said that Tawang polder system development investment is relatively large with a budget of Rp Rp. 5.888883 billion, - with details of the source of funds from BLN USD. 4.711106 billion, - and the Fund II Special Presidential Assistant for Rp.1.177.777.000 be considered failed if it does not produce a use value / benefits such as the provision of raw water supply for fire fighting, watering the garden city and the development of tourism.
6. In the context of this polder Semarang Tawang then use the value obtained by counting the number of families who benefit from the existence of the polder. The direct beneficiaries include the population of the Village Bandarharjo, Tawang Mas and Purwodintan. Based on statistical data from the BPS in 2012 the total population of the three villages is 58 381 inhabitants with the number of families of 16 396 households. Based on the results of FGD has been done then there are 59% who expressed such direct benefit from the guarantee of the flood area (extreme flood).
7. Polder development aimed at flood control is expected to ensure the community surrounding polders to run their economic activities. When viewed from the family economic data, the average family income is Rp. 1.200.000, -. From this information it can be calculated using the value (*use value*) is  $(59\% \times 16,395) \times \text{Rp. } 1.200.000$ , - to Rp. 11,607,660,000, -. If specified then the DUV (*direct use value*) is  $60\% \times (59\% \times 16,395) \times \text{Rp. } 1.200.000 = \text{Rp. } 6.964596 \text{ billion,}$

- and indirect beneficiaries is  $30\% \times (59\% \times 16,395) \times \text{Rp. } 1.200.000 = \text{Rp. } 3.347298$  billion, -.
8. *Value option (option value)* associated with the use of options in the future environment. Uncertainty of future use is closely related to the uncertainty of the environment so that the option offers more value is defined as the value of maintenance resources so that option is still available for use for the future. Based on the results of the FGD option value (OV) is about 10% or 10% can be calculated  $\times (59\% \times 16,395) \times \text{Rp. } 1.200.000 = \text{Rp. } 1.115766$  billion, -
  9. Economic value can be seen from the number of local government budgets in the flood control program in 2012 at 22 billion, and if the overall budget is allocated into the program (1) control the flood (50.2%), (2) the conservation area of the city old (24.6%), (3) tourism (8.5%), fire (5.4%) and the development of fisheries (3.8%).
  10. Family survey results in three villages showed that the number of poor by 15 646 people or about 26.8% with Bandarharjo details of 5,659 souls, Tanjung Mas Purwodinatan of 8,601 people and 1,386 for the soul. The calculation result of the absorption of labor by 2,155 person-days (HOK) is calculated from components such as cleaning polder polder maintenance, grass cutting, maintenance of equipment, painting and cleaning the river. By using standard assumptions wage of Rp. 40.000, - per day then this polder maintenance has been growing in the value of money amounting to Rp. 86.2 million, -
  11. Economic valuation of environmental services can also be done through either the revealed

preferences (revealed preference) or stated preference (stated preference). This assessment basically determines the value of environmental services based on willingness to pay (WTP) of individuals or communities were abstracted from the preferences of the community through the auction (*bid*) is offered. Approach to Contingent Valuation Method (CVM), the WTP (*willingness to Pay*) can be categorized into normal society where value is the highest bidding 1,000, - per household, for a group of community leaders willingness to pay a maximum of Rp. 2,000, -, Rp merchant group. 1500, - and the group of companies around Rp. 10,000 to Rp. 20.000, -. While the WTA (*willingness to Accept*) this arise due to people's preference for immediate free from the flood, so that economically the flood condition has been exhausting, mind and financially in every family.

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